

# The Canadian Entomologist.

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VOL. XXXV.

LONDON, JUNE, 1903.

No. 6

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NOTES ON CANADIAN SPECIES OF THE GENUS *APANTESIS* (*ARCTIA*), WITH SPECIAL REFERENCE  
TO THE LARVÆ.

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(Continued from page 123.)

9. *QUENSELII*, var. *TURBANS*.—Probably one of the most interesting surprises we have had since studying these insects, is the fact that the form just mentioned has been taken, and not uncommonly, for some seasons, at several points in Manitoba and the Northwest Territories. The first specimens we examined were collected "at light" at Calgary, by Mr. T. N. Willing. Afterwards Mr. F. H. Wolley-Dod, of Millarville, Alta., forwarded us a beautiful series of nine specimens for study, and Mr. Norman Criddle, of Aweme, Man., also was good enough to send us four examples. Besides these 13, Mr. Willing forwarded seven specimens. While in Washington, in December, 1902, Dr. Fletcher submitted a series of the moths to Dr. Dyar, who compared them with the original description of *turbans*, afterwards expressing himself as certain that our Northwestern form was this variety of *quenselyi*.

The 20 specimens before me are fairly uniform, and have a wing expanse of 26–35 mm. None of them show any traces of spots or markings on the secondaries other than those shown in the specimens on the accompanying plate. The markings on the primaries vary chiefly in width, but the three specimens figured give a good idea of the moth. Only one specimen shows any departure, and in this, as will be seen by the photograph, there is a decided tendency to melanism, but only, however, on the primaries. The secondaries of all the males, excepting two, are distinctly yellow, the same colour as *virguncula*, and the marginal markings are remarkably uniform and distinct, with no tendency whatever to melanism. The hind wings of the females are likewise yellow, with the exception of those of two specimens which are orange,

the same as the two males. The moths remind one, somewhat, of *virguncula*, and have been so labelled by some students. They are, however, easily separated from that species, being smaller, and having more white markings on the primaries.

Mr. Wolley-Dod says that the moths are "very common during dry seasons, less so of late years," and that the reddish tinge on the secondaries seems unusual. He also says that the larva feeds chiefly on what he believes to be *Galium*, the imagoes appearing about the end of July and in August. I hope that western collectors will be on the lookout for females of this interesting Arctian, and try to obtain eggs so that we may learn something of its life-history.

*Distribution*.—Olds, Alta., August 9, 11 (Willing); Sylvan Glade, near Olds, Alta., Aug. 26 (Willing); Calgary, Alta., Aug. 7 (Willing); July 29, 30 (bred), Aug. 3 (bred), 5, 8, 9, 12, 16, 18 (Wolley-Dod); Aweme, Man. (Criddle).

10. *OBLITERATA*.—While Dr. Dyar was examining the specimens of *quenselii*, var. *turbans*, just referred to, he made the discovery that one of Mr. Wolley-Dod's examples, which we had associated with that form, was the lost species *obliterata*. The noticeable differences between this specimen and the others are, as is shown on the plate, the presence of two additional discal spots on the secondaries, and a dark dash leading to the base of the wing. The colour of the secondaries is orange, the same as in some specimens of *turbans*. It would appear that *obliterata* may be only a variety of *turbans*, but of course further investigation is needed, and I trust the opportunity will come to some one living where *turbans* occurs.

*Distribution*.—Calgary, Alta., Aug. 15 (Wolley-Dod).

11. *BOLANDERI*.—A single ♂ collected at Aweme, Man., by Mr. Criddle, has been so named by Dr. Dyar. This Arctian is given in Dr. Dyar's new catalogue as a synonym of *Blakei*, and the specimen in question agrees very well with the figure of *Blakei* on Plate V., Proc. Ent. Soc. Philad., Vol. III. Three ♀ moths received from Mr. Wolley-Dod, and collected at Calgary, Alta., which we cannot exactly place, come very close to Mr. Criddle's specimen, but are larger. Dr. Dyar has published the life-history of *Bolanderi* in the Proceedings of the Boston Society of Natural History, Vol. XXVI., and describes the larva\* as "black, dorsal

\*Jour. N. Y. Ent. Soc., Vol. VIII., p. 46.

band vermillion red, pale in the incisures; segments white dotted posteriorly; wart iii bright red at base, the subventral warts pale. Hair stiff, reddish subventrally." Our Canadian form ought to be bred to see if the larvae agree with those studied by Dr. Dyar. Doubtless the species will have to be gone over several times before we can get a true knowledge of its variations.

*Distribution*.—Aweme, Man. (Criddle).

12. *NEVADENSIS*, var. *INCORRUPTA*.—This is another Arctian which we did not know occurred in Canada. It also has been found in the West, the only specimens we know of having been collected at Calgary, Alta., and Aweme, Man. The 10 examples we have examined ( $7\delta$ ,  $3\varphi$ ) are very similar in markings and do not show any variation other than that appearing on the accompanying plate. The moth is an attractive one, the colour of the secondaries of all the specimens being almost a poppy-red, or rose vermillion. The colour of the abdomen above is the same as that of the hind wings, excepting at the tip, where it is a cream colour, as is also the ventral surface, excepting in the  $3\varphi$  and  $1\delta$  which have the under surface of the abdomen black with the posterior edge of each segment ringed with white. A dorsal and a lateral row of black spots occur on all the specimens, and in those which have the segments drawn closely together these appear as wide bands. A single  $\varphi$  Arctian (collected June 28) received from Mr. Wolley-Dod, with the primaries marked as in *incorrupta*, had pure black secondaries, as well as a black body. I do not know of anything having been published on the earlier stages of *incorrupta*, and any information on the life-history would be very welcome. Dr. Dyar, in his description of the larva of *superba*, as hereafter mentioned, stated that he thought this to be that of *incorrupta*. This shows that much work is to be done yet before we can acquire definite knowledge. Mr. Coquillett describes the larva of *Nevadensis* as black, with a broken, dull white dorsal line, warts gray, the hairs varying in colour (mixed black and reddish or black and yellowish).

*Distribution*.—Arcola, Assa., Aug. 20 (Willing); Calgary, Alta., Aug. 7 (Willing); July 7, 30 (bred), Aug. 6 (Wolley-Dod); Aweme, Man., Aug. 1, 5 (Criddle).

13. *SUPERBA*.—The only examples of this form which we have seen were collected on Vancouver Island. In the "Bulletin of the Natural History Society of British Columbia," 1893, is a list, by Mr. W. H. Danby, of Lepidoptera collected in British Columbia, and in this list *superba* is

noted as "occurring everywhere." Recent collectors, however, report it as scarce. While in New York in December last, Dr. Fletcher compared the specimen figured, with the type of *superba* in the American Museum of Natural History. Dr. Dyar in his list places *superba* as a variety of *Nevadensis*, and in a recent paper\* describes the larva as follows: "Head shining black, labrum yellowish, antennæ pale, pinkish at base; width 3.3 mm. Body black, thoracic feet black, the abdominal ones pinkish, pale. Warts large, normal, arctiiform, i. and ii. with shining bases, i. over half as large as ii., which is elongate. Hair abundant, bristly, sparsely barbed, rather short before, long on joints 12 and 13; most of the hair from wart i. and a few on the sides of ii. are yellow, below this jet-black mixed with white, mostly white from warts iv. to vi. Warts iii. orange, the rest black. A light yellow dorsal line, broken into three spots on each segment, distinct, most of them lanceolate; a line on joints 2 and 3; no shields; joint 2 with little warts, normal. A variety had the dorsal line nearly obsolete, composed of a few dots; wart iii. black like others. Hairs nearly all yellow, only a few black ones mixed; some longer white ones posteriorly." To this description is added "I think, however, that this is the larva of *A. incorrupta*, of which I have only males."

It is to be hoped that British Columbian collectors will endeavor to work out the complete life-history of this interesting form. The moths may be much commoner than we imagine. Many of our western Arctians run very close together, and large series of the moths should be bred from eggs, with the female which laid them correctly associated.

*Distribution*.—Victoria, B. C., July 9, 11 (Anderson); Hampson gives Fraser R. (St. John) and Vancouver Island as localities for this insect.

14. *WILLIAMSII*, var. *DETERMINATA*.—Specimens of the typical form of *A. Williamsii*, Dodge, must be very rare. All the specimens we have, and those which have been loaned by correspondents, have proved to be the variety *determinata*. Dr. Fletcher submitted a good series of the moths to Dr. Dyar, who named them all *determinata*. This form is reported as the commonest Arctian in Manitoba and the Northwest. Dr. Fletcher has collected numbers of specimens, and Mr. F. H. Wolley-Dod, of Millarville, Alta., reports that *determinata* is "apparently the most

\*Proc. U. S. Nat. Museum, Vol. XXV., 1902, p. 372.

regularly common species of the genus. Have taken it most commonly at light, end June and July, but have seen it flying in sunshine." None of those we have examined agree with Dodge's figure of *Williamsii*, admittedly not correct, in CAN. ENT., Vol. III., p. 167, every specimen having the extra transverse band on the primaries. During the past summer Mr. A. J. Dennis, of Beulah, Man., kindly sent me a batch of eggs of *Williamsii*, var. *determinata*; but, unfortunately, only two of them hatched. These eggs were laid about the 1st July, and hatched on the 9th. The two larvae reached Stage VI.; one has since died, but the other is now hibernating. The notes on the six stages, presented herewith, are, I believe, the only knowledge we have of the larvae. In 1885, on May 31, Dr. Fletcher found one larva on *Erigeron filifolius*, Nutt., at Kamloops, B. C., the moth emerging Aug. 1; other larvae were seen under stones, and at Spence's Bridge, B. C. (June 1), on *Senecio*.

*Stage I.*—Length at first 1.8 mm., colour dirty whitish, after feeding greenish. Head 0.3 mm. wide, dark, slightly bilobed; mouth-parts reddish. On each segment of body is the usual row of transverse tubercles; these are black and shiny. Cervical shield black. Bristles long and slender, those from tubercles on dorsum black, from the lateral tubercles silvery and longer than the black bristles. Tubercle i. small, ii. very large, iii., iv. and v. nearly same size. Bristles finely barbed. Tubercles ii., iii., iv. and v. are surrounded with brownish-red. Feet concolorous, marked exteriorly with brown. Three days after hatching a pale blue dorsal stripe was discernible.

*Stage II.*—Length 4.5 mm. Head 0.5 mm. wide, brown, darker at apex, ocelli black. The larvae in general appearance are brownish, but under a lens the skin from the inside edge of tubercle i. to the lower edge of ii. is seen to be reddish-brown, except at intersegmental folds where it is greenish; with a medio-dorsal stripe of pale blue. The skin between ii. and iii., iii. and iv., iv. and v. and vi. is yellowish, or greenish-yellow, paler subventrally, blotched with reddish-brown. Tubercles black, i. very small, ii. large, iii. and iv. about same size, v. smaller than iv., and vi. smaller than v. Bristles from i., ii. and iii. nearly all black, only a few silvery ones from iv., and from lower tubercles silvery. Bristles faintly barbed, of varying lengths, the silvery ones slender and longest. Spiracles small, black, close in front of tubercle iv. Feet concolorous, semi-translucent, darkened exteriorly.

*Stage III.*—Length 5.5 mm. Head 0.7 mm. wide, blackish. The two larvae in this Stage do not show any difference from Stage II. The general colour is the same, as is also the pale blue dorsal stripe, and the yellowish colour of the skin between tubercles ii. and iii., iii. and iv., iv. and v. and v. and vi., shading to greenish subventrally. Tubercles black and shiny; bristles as before, the black ones mostly from i., ii. and iii., and the silvery or slightly rusty bristles from iv. and lower tubercles. Thoracic feet blackish, shiny; prolegs, upper portion blackish, lower portion pale.

*Stage IV.*—Length 9.5 mm. Head 0.9 mm. wide, black with exception of a pale brownish space on cheek above ocelli. The general appearance of the larvæ in this Stage is darker than in Stage III. The skin of dorsum is mostly blackish, and shades to blackish-gray subventrally. The dorsal stripe is conspicuous, and now almost a cream colour. The yellowish blotches along the sides are still present and the series between ii. and iii. appears almost as a lateral stripe. The tubercles and bristles are as in last Stage. Spiracles small, black, close in front of the lower edge of tubercle iv. Thoracic feet black; prolegs, upper half blackish, lower half paler.

*Stage V.*—Length 12.5 mm. Head 1.2 mm. wide, black, shiny. Body in general appearance blackish. Skin on dorsum grayish, mottled and blotched with velvety black. Skin on sides yellowish-gray and also blotched with black, but not so heavily marked as on dorsum. Venter much paler than dorsum. Dorsal stripe conspicuous, yellowish, creamy at intersegmental folds. Tubercles black, shiny. Between tubercles ii. and iii. is a distinct lateral band of pale yellow. The whole of tubercle ii. on the inside is margined with pale yellow. The skin between iii. and iv. and iv. and v. is also rather intensely yellow. Spiracles black close in front of iv. Each tubercle has a bunch of barbed bristles, those from i., ii. and iii. being black, while those from iv. and lower tubercles are mostly pale rusty. The dorsal tubercles on segments 12 and 13 bear a few very long slender bristles, which are pale grayish at tips. Thoracic feet shiny, black.

*Stage VI.*—Length 14 mm. Head 1.6 mm. wide, subquadrate, slightly bilobed, black, excepting just above ocelli, where there is a pale brownish patch with dark mottlings; hairs on face black, of varying lengths; mouth-parts reddish. Body black, shading to grayish-black ventrally. Under a lens, the skin is grayish mottled with velvety black,

especially on the dorsum. Dorsal stripe, orange-yellow, whitish at intersegmental folds. Tuberles as before, i. about one-fifth the size of ii., which has a polished base. The lateral band between ii. and iii. is as before, same colour, but not so bright as the dorsal stripe. The skin between iii. and iv. and iv. and v. is also yellowish, as in last Stage. Bristles from tubercles i., ii. and iii., and mostly from iv., black; only a few pale rusty bristles from iv.; from v. and lower tubercles the bristles are all pale rusty. Thoracic feet black, shiny; prolegs dark, tinged with dull red.

The ♀ moth which laid the eggs has since been received and labelled by Dr. Dyar "*Williamsii*, var. *determinata*." It is shown on the plate herewith, as well as a typical ♂. As this Arctian is so common where it occurs, I trust that our western friends will secure eggs the coming season, so that we may get further light on this interesting species. It seems strange that of all the specimens of *determinata* we have examined (30), only two are females, and these two, if it were not for the additional transverse bar on the primaries, would agree remarkably well with Dodge's figure of *Williamsii*.

*Distribution*.—Kamloops, B. C., Aug. 1, bred (Fletcher); High River, Alta. (J. Baird); Calgary, Alta., June 21, 23, July 14, 16, 23 (Wolley-Dod); Aug. 7 (Willing); Prince Albert, Sask., July 6 (Fletcher); Alameda, Assa., July 9 (Willing); Carnduff, Assa., July 6 (Willing); Cartwright, Man., June 21, 29, July 3-15 (Heath); Aweme, Man. (Cridde); Beulah, Man., July 1, 6, 15 (Dennis); Elkhorn, Man., July 8 (Fletcher); Ignace, Ont., July 19 (Fletcher); Sudbury, Ont., July 18 (Evans).

15. *PHYLLIRA*.—As mentioned, this Arctian is thought by some to be the same as *rectilinea*. True *phyllira* has not the veins of the primaries lined, whereas in true *rectilinea* these are conspicuously lined (see plate). The only Canadian specimens I have seen of *phyllira* were collected at London, Ont. We have received other records of the capture of this insect in Ontario, but have not seen the specimens, and these records are included on the authority of the collectors themselves. The species is, I believe, southern in its range. The life-history has been published by Packard, and, as previously mentioned, our larvæ of *rectilinea* answered very well to Packard's description of *phyllira*. Further breeding will have to be done, however, before definite information can be had regarding both these forms, which now have recognized specific names.

*Distribution*.—London, Ont. (Geo. Anderson); July 6 (A. P. Saunders); Sept. 6 (H. S. Saunders)\*; Orillia, Ont., June 28, July 5 (Grant).

16. *CELIA*.—Through the kindness of Dr. Bethune, who has generously presented the original type of *celia* to the Division of Entomology, we are able to figure it on the plate accompanying this article. It will be noticed that the photographs of *celia* and *determinata* ♂ are very much the same, but the moths themselves seem quite distinct, although it is difficult to describe the differences. Five specimens of *celia* are before me, and none of them are anything like *phyllira*, of which *celia* has often been referred to as a synonym. All the five specimens, four of which were submitted to Dr. Dyar, are smaller than the type, and show a decided tendency to melanism. A single egg of *celia* was obtained by Mr. C. H. Young, from a female moth which he collected at Meech Lake, Que. (near Ottawa). This egg, which was laid on May 27 and hatched June 9, he kindly gave to the writer, who reared the larva through six moults. After reaching Stage VII. and feeding for some days it went into hibernation. When examined later, however, it was noticed that a disease had attacked the specimen, so it was killed and inflated. As will be seen from the following notes on the larval stages, our specimen was a fairly large caterpillar, and not at all like the larva of *phyllira* as published by Packard. Saunders's description of the mature larva of *celia* agrees very well with our notes on Stage VII. as given below. Further investigation, however, is needed. The full-grown larva described by Saunders was found under a log in a wood near London, Ont., on June 11.

*Stage I*.—Length newly-hatched, 2 mm. Colour at first dirty creamy white, after feeding greenish, with a tinge of brown. Head 0.3 mm. wide, shiny; cheeks almost wholly black, just above ocelli pale brownish; clypeus and lower portion of face pale brownish; mouth-parts blackish. On each segment is a transverse row of black tubercles, i. almost half the size of ii., which is the largest, iii. nearly as large as ii., iv. about same size as iii. Cervical shield dark brown, bearing the usual 8 tubercles. Skin of body smooth, shiny. Setæ from dorsal and upper lateral series of tubercles mostly black, only a few silvery bristles; from remaining tubercles, silvery. Bristles finely barbed. Thoracic feet slightly darker than body; prolegs concolorous.

\*CAN. ENT., Vol. XXI., p. 60.

*Stage II.*—General colour dull reddish-brown, with a faint pale dorsal stripe, the food showing through front segments giving a greenish appearance to anterior portion of larva. Head 0.5 mm. wide; cheeks black; median suture pale; clypeus, with exception of centre, pale, as is also space above ocelli. Skin of body surrounding tubercle ii. and lateral tubercles, more or less reddish-brown; skin at joints of segments green. Ventral surface green. Tubercles black, shiny. The skin between the two tubercles i. shows up against the reddish-brown surrounding ii., as a faint dorsal stripe. Bristles from dorsal tubercles black; from iv. and lower tubercles pale. On segments 12 and 13 are a few longer black hairs. Spiracles very small, black, close to tubercle iv. All the feet slightly darker than venter.

*Stage III.*—Length 5.5 mm. Head 0.8 mm. wide, as before. Cervical shield black, shiny. Skin of body much as in last Stage, reddish-brown. Dorsal stripe pale yellow, even, distinct on all segments. Tubercles black, shiny, ii. with a polished base; bristles barbed. Bunches of black bristles, with a few yellowish ones, from tubercles ii. and iii., only a few bristles from i. Lower bristles from iv. pale yellowish or a reddish tinge, from upper half of iv. black; from tubercles below iv. all pale. Skin of body between iii. and iv., iv. and v., and below v., reddish. Ventral surface paler than dorsal. Spiracles small and black. Thoracic feet blackish; prolegs concolorous with venter inside, but blackish outside.

*Stage IV.*—Length 7 mm. Head 1.0 mm. wide, black, shiny, median suture and space on cheek above ocelli, pale brownish; hairs on face mostly dark. Body dark brownish, mottled and splashed with velvety black. Dorsal stripe reddish-yellow, rather indistinct. The colour of the skin along the sides immediately below tubercles ii., iii., iv. and v. is orange, giving the appearance of series of dashes of that colour. Tubercles as before. Bristles from all the tubercles mostly black; only a few, comparatively speaking, are pale. Spiracles black, almost touching anterior edge of tubercle iv. Feet as before.

*Stage V.*—Length 12.5 mm. Head 1.4 mm. wide, as in last Stage. Skin of body black, with exception of orange-red dashes above tubercles iii., iv., v. and vi.; these are not conspicuous. Dorsal stripe has almost disappeared, only a faint trace of it now. Tubercles black, shining, ii. with a polished base. Venter not so dark as dorsum. Spiracles black, close in front of tubercle iv. Bristles from tubercles i., ii. and iii. black,

from other tubercles mostly black, with a few pale yellowish-red ones intermingled. Thoracic feet jet-black, shiny; prolegs exteriorly, upper two-thirds black, shiny, lower third reddish. Later in the Stage the skin loses its black intensity, and becomes more of a dark reddish-brown, blotched with gray and black, and the orange-red dashes on sides become more conspicuous.

*Stage VI.*—Length 18 mm. Head 1.9 mm. wide, black, shiny, epistoma sordid white. Body almost wholly black, no dorsal stripe now. The skin immediately between tubercles iii. and iv., iv. and v. and v. and vi. is now only faintly reddish. Tubercles black, shiny, ii. with a broad polished base. All the bristles from the tubercles are black, with the exception of a few pale reddish ones from tubercles vi., vii. and viii. Spiracles black, touching anterior edge of tubercle iv. Thoracic feet black; prolegs reddish.

*Stage VII.*—Length 25 mm. Head 2.6 mm. wide, subquadrate, very slightly bilobed, black, shiny; posterior median space of cheek brownish; epistoma whitish; mouth-parts reddish; hairs on face black. Skin of body wholly velvety black. Tubercles black, shiny, large and conspicuous, i. nearly one-quarter the size of ii., ii. with a broad polished base, iii. smaller than ii. Each tubercle above the spiracles has a bunch of black, finely-barbed bristles, of varying lengths. The only rusty bristles are from tubercles v., vi., vii. and viii., and these are a dark rust-red. The dorsal tubercles on segments 12 and 13 bear a few extra long bristles. Spiracles wholly black, touching on abdominal segments the anterior edge of tubercle iv. No markings of any kind on the body. Thoracic feet black, shiny, reddish at tips; prolegs reddish.

When the larva stopped feeding, eight days after the sixth moult, it measured 30 mm. long, and 6 mm. wide at segment 8.

*Distribution*—Banff, Alta., June 16 (N. B. Sanson); Aweme, Man. (Cridde); London, Ont., June 30, bred (Saunders); Toronto (Bethune, Croft); Meech Lake, Que., May 26 (Young); Montreal, Que., June 20 (P. M. Dawson); Cowansville, Que. (Fyles).

17. *FIGURATA*.—This form has been referred to as a variety of *phyllira*, but Dr. Dyer in his recent catalogue gives it specific rank. The species (if such it is) is rare in Canada. Full notes on the earlier stages would be very welcome. Mr. E. L. Graef briefly describes the mature larva as "jet-black, hairs very stiff." In the Proc. U. S. Nat. Museum,

Vol. XXV., 1902, Dr. Dyar published the following description of the larva of the form *f-pallida*: "Head shining black; epistoma and bases of antennæ pale; width 2.7 mm. Body brown-black, the abdominal feet pale reddish. A broad, distinct, sharp dorsal line, narrowed between warts i., cream-white, pinkish shaded in the incisures. Warts black, hair bristly, sparsely barbed; i. small, less than one-third the size of ii., i. with small, ii. with large shining base, normal. Hair all black, even the subventral, longer on joints 12 and 13."

*Distribution*.—Toronto, Ont. (Gibson); Meech Lake, Que., May 31 (Young); Aylmer, Que., June 5 (Young).

18. NAIS.—This is a very variable species and one which is constantly being mixed up with *phalerata*. Dr. Seifert has recently published an article on the species in the Journal of the New York Entomological Society, March, 1902, and the plate accompanying his paper gives an excellent idea of the extent of variation in the moths of this Arctic. Through the kindness of Dr. Seifert in sending us eggs, we were able, the past season, to rear a good number of the imagoes. The larvæ also vary considerably and we cannot find any character whereby to distinguish them from the larvæ of *phalerata*.

*Distribution*.—Springfield-on-Credit, Ont. (Bethune); Kingsville, Ont., Sept. 9 (C. T. Hills); Hamilton, Ont. (Evans); Montreal, Que., July 7 (Stevenson). These records are included on the authority of the collectors themselves. We have not examined the specimens.

19. VITTATA.—This species, while it has often been collected, in different localities, cannot be considered a common insect in Canada. The moths are closely related to *nais* and *phalerata*, and a series will show considerable variation. A single specimen was bred at Ottawa in 1900 from a larva collected in a wood on the 26th May. The following description was taken from the cast skin and head: Head black; skin of body velvety black, tubercles black, rough, not polished, each bearing a bunch of bright rust-red bristles, those on the dorsum being slightly darker; none black. Bristles smooth, not barbed; tubercle i. about one-fifth the size of ii. Thoracic feet blackish-brown.

*Distribution*.—Hamilton, Ont. (Moffat, Evans); St. Catharines, Ont. (Beadle); Toronto, Ont., June (Metcalfe, Gibson); Cobourg, Ont., August (Bethune); Ottawa, bred, June 11 (Gibson); Montreal, Que. (Brainerd).

20. *PHALERATA*.—The life-history of this Arctian was published by the writer in the CANADIAN ENTOMOLOGIST, Vol. XXXII., p. 369, and in the February (1902) number of the same journal further additional notes were given. On the whole, the moths of *phalerata* are fairly constant. In those which we reared in 1900, there was a remarkable lack of variation; but in some of those bred the following year the W mark on the primaries was indistinct, and in a few (females) nearly obsolete. In none of our specimens, however, is the W mark altogether absent, as is often the case in *nais*. In all the specimens of *nais* which we have reared, the costal edge of the primaries is black, and this character has been referred to in several accounts of that species. In *phalerata*, however, the costal edge of the primaries is yellow in some specimens and black in others, in the same brood. On the accompanying plate two females and two males are figured, one female with a black costa, the other with a yellow costa, and the same with the males. The larvae of *phalerata* vary chiefly in the colour of the bristles; in most of our specimens these were black dorsally and rust-red subventrally. Some larvae had bristles of a decidedly pale grayish colour, other specimens had these more of a yellowish tinge, while still other examples had nearly all the bristles of a pale rust-red colour. A dorsal stripe, or a series of elongated spots, was present in some specimens, while others had no markings whatever on the body.

*Distribution*.—This species doubtless occurs in various districts in eastern Canada, but the only Canadian specimens examined and identified by Dr. Dyar were collected at Toronto, Ont., by the writer.

In conclusion, I beg gratefully to acknowledge much assistance in the preparation of this paper from my kind and ever-helpful teacher, Dr. James Fletcher. The writer is also under much obligation to Dr. Dyar for help, and to his many friends who have sent him material to study and specimens to examine, as well as records of species in their collections. My thanks are also due to Dr. Charles Saunders who took the photograph from which the accompanying plate was made. We shall be very glad indeed at all times to correspond with any one interested in these Arcticans, and shall, of course, be most happy to receive for study, eggs or larvae of any species of the genus. Material of the commonest kind will be gladly welcomed.

CLASSIFICATION OF THE FOSSORIAL, PREDACEOUS AND  
PARASITIC WASPS, OR THE SUPERFAMILY  
VESPOIDEA.

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(Paper No. 14.—Continued from Vol. XXXV., p. 107.)

SURFAMILY II.—*Methocinæ*.

1894. Myrmosini, Tribe II. (partim), Fox; Proc. Acad., Sci., Phila., p. 273.

1896. Myrmosini, Tribe II. (partim), Ashmead; Trans. Am. Ent. Soc., XXII., p. 179, 180.

1899. *Methocinæ*, Tribu 3e (partim) André; Spec. Hym. d'Eur Tom. 8, p. 58 and 71.

1903. *Methocinæ*, subfamille (partim), André; Wytsman's Gen. Ins. Fam. Mutillidæ, p. 6.

Mr. Ernest André's conception of this subfamily is erroneous; he has placed in it a number of genera that do not belong to the family *Thynnidae* at all, but are genuine Myrmosids; and represent my tribe *Chyphotini*. Moreover, André has incorrectly classified all of these genera in the family *Mutillidæ*, an error Fox and myself also fell into years ago, before we had studied the *Thynnidae*.

Mr. Frederick Smith, of the British Museum, was apparently the first to point out that *Methoca* belonged to the *Thynnidae*, although he still retained it among the *Mutillidæ*. Dr. David Sharp, in Cambridge Natural History, Vol. 5, p. 96, has also correctly placed *Methoca* with the *Thynnidae* and gives a good figure of both sexes of *M. ichneumonides*, Latr.

Table of Genera.

Females . . . . .	I.
Males . . . . .	2.
1. Scutellum not differentiated, entirely absent; prothorax and mesothorax finely transversely aciculated; head large, much wider than the thorax, finely sculptured, opaque; eyes large, finely pubescent;	

clypeus rounded anteriorly; mandibles large, curved, edentate; maxillary palpi 5-jointed, the lateral palpi 4-jointed (Africa)..... Andréus, Ashm.\* gen. nov.  
 (Type A. Abbottii, Ashm.†)  
 Scutellum differentiated, represented by a convex elevation; thorax and head smooth, shining; eyes bare or nearly; maxillary palpi 6-jointed, the labial palpi 4-jointed..... Methoca, Latreille.  
 (Type M. ichneumonides, Latr.)

2. Front wings with the first transverse cubitus wanting, the first and second cubital cells confluent.

Clypeus anteriorly produced into a triangular tooth; abdomen long, cylindrical, the hypopygium ending in a single upward-curved aculeus..... Methoca, Latreille.

#### SUBFAMILY III.—*Rhagigasterinæ*.

This subfamily ought to be easily distinguished by the characters employed in my table of subfamilies. The genus *Lophocheilus*, Guérin, I know only from the description and figure, and its position is uncertain, although I am inclined to think that it belongs here, and may ultimately prove to be the opposite sex of *Eirona*, Westwood.

Table of Genera.

Females.....	1.
Males.....	5.
1. Head <i>without</i> a sulcus or grooved line on temples behind the eyes (Tribe II., Diammini).....	2.
Head quadrate, <i>with</i> a sulcus or grooved line on temples behind the eyes (Tribe I., Rhagigasterini).	
Claws simple; grooved lines on temples, curved and not quite extending to the eyes; maxillary palpi 6-jointed, labials 4-jointed; first ventral segment simple (North America).....	Glyptometopa, Ashmead. (Type G. Americana, Ashm.)

\*Named in honor of Mr. Ernest André.

†Andréus Abbottii, sp. n.—Female: Length, 7 mm. Black; antennæ, except the last five or six joints, the mandibles, the palpi and the legs, ferruginous; anterior margin of the clypeus narrowly yellowish-white; abdomen black, polished, shining, the last two segments flavo-testaceous.

Type.—Cat. No. 6812, U. S. N. M.

Hab.—Congo, Africa (Dr. W. L. Abbott).

Claws cleft ; grooved line on the temples straight and extending from the eyes to the occiput ; maxillary palpi 6-jointed, labials stout, 4-jointed ; first ventral segment with a tooth beneath (Australia)..... Rhagigaster, Guérin.  
 (Type *R. unicolor*, Guér., ♂.  
 = *Diamma ephippiger*, Guér., ♀.)

2. Claws cleft..... 3.  
 Claws simple..... 4.

3. Head subquadrate, not or scarcely longer than wide ; eyes very large ; ocelli present ; mandibles 3- or 4-dentate ; maxillary palpi 6-jointed, labials 4-jointed (Australia)..... Diamma, Westwood, 1835.  
 = *Trachypterus*, Guér., 1839.  
 (Type *D. bicolor*, Westw.)

Head oblong, more than twice longer than wide ; eyes minute ; ocelli wanting ; mandibles at apex bidentate ; maxillary and labial palpi both 4-jointed (Australia)..... Eirone, Westwood.  
 (Type *E. dispar*, Westw.)

4. Head large, oblong, longer than wide ; eyes minute ; maxillary and labial palpi both 4-jointed (South America)..... Aelurus, Klug.  
 (Type *A. nasutus*, Klug.)

Head large, subquadrate, a little wider than long, and much wider than the thorax ; prothorax ovate ; mandibles (?) simple ; maxillary palpi 6-jointed (Australia)..... Ariphon, Erichson.  
 (Type *A. bicolor*, Erich.)

5. Mandibles tridentate..... 6.  
 Mandibles bidentate..... 9.

6. First transverse cubitus *without* an appendage, the first cubital cell undivided ..... 7.  
 First transverse cubitus *with* an appendage or spurious nervure, which divides the first cubital cell into two more or less distinct cells..... 8.

7. Second cubital cell receiving both recurrent nervures ; maxillary palpi 6-jointed, labials 4-jointed..... Diamma, Westwood.  
 Second cubital cell receiving only one recurrent nervure—the first, the second recurrent nervure being interstitial, or nearly, with the second transverse cubitus (Australia)..... Oncorhinus, Shuckard.  
 (Type *O. xanthospilus*, Shuck.)

8. Third cubital cell *larger* than the second, the second and third each receiving a recurrent nervure; clypeus not prominent, with a slight triangular emargination or impression anteriorly; apical tooth of mandible much longer than the two inner teeth; maxillary palpi 6-jointed, labials 4-jointed (South America) .. *Telephoromyia*, Guerin.  
 (Type *T. rufipes*, Guer.)

Third cubital cell *shorter* than the second; clypeus not produced, excised anteriorly; maxillary palpi 6-jointed, joints 1-3 short, 4-6 very long; labial palpi 4-jointed..... *Aelurus*, Klug.

9. Clypeus somewhat produced, the anterior margin subarcuately emarginated, the labrum more or less exposed, ciliated; maxillary palpi 6-jointed, first joint of flagellum shorter than the second (Australia)..... *Lophocheilus*, Guérin.  
 (Type *L. villosus*, Guér.)

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#### THE LARVA AND PUPA OF THE APPLE BUD-BORER

(*Steganoptycha pyricolana*, Murt.).

BY E. DWIGHT SANDERSON, AGRICULTURAL COLLEGE, TEXAS.

In studying the larva and pupa of *Steganoptycha pyricolana*, Murt., some observations were made as to structure, which it seems desirable to permanently record. The life-history and habits of the species have been described in the Twelfth Report of the Delaware Agricultural Experiment Station.

"This species was described by Miss M. E. Murtfeldt, in Bulletin No. 23, o. s., Div. Ent., U. S. Dept. Agr., p. 52, as *S. pyricolana*, Riley MS. Concerning the identity, it was stated that 'Professor Fernald, to whom a specimen was shown, considers it identical with Clemens's *S. salicicolana*, which, I believe, breeds in willow galls, but Dr. Riley pronounces it distinct, and he has types of Clemens's species.' My specimens agree entirely with Miss Murtfeldt's description, but are distinctly different from Clemens's types in the collection of the Am. Ent. Society. Correspondence shows that the opinion credited above to Dr. Fernald is incorrect, as he never compared the specimens. Dr. Fernald, to whom specimens were referred, has kindly given the identity of the species considerable attention, and writes me that he has frequently received speci-

mens from various parts of the country, where the larva has been boring in rose. He also states that there is probably no doubt as to my specimens being the same as Riley's *S. pyricolana*.

"Miss Murtfeldt found the larva damaging apple terminals in Missouri in August and September, 1890, and gives an excellent description of the larva and moth. This is the only published reference to the species so far known.

"*Larva*.—5 x 1.25 mm. Elongate, sub-cylindrical; colour from a dirty cream to light yellowish-brown, tinged with pinkish dorsally—usually giving it quite a rose colour, tubercles grayish, spiracles brown; head slightly narrower than prothorax, metathorax to 7th abdominal segment of same width, thence tapering sharply caudad; head shining, front cinnamon brown, sutures darker with blackish line, an indefinite caudo-mesal area slightly darker and a similar darker shade on each dorso-lateral surface caudally, joining on caudal margin under pronotum; labium and maxilla body colour, sutures of under side of head dark, palpi and antennæ light, latero-ventral sutures of head black, ocelli black, forming a short black bar extending caudo-dorsad back of antennæ, labrum dark brown; abdominal segments with two and thoracic with three annuli; pronotum chitinous straight, cephalic margin covering caudal part of head which is visible beneath, caudal margin curved, surface shining; legs with basal suture in front dark, otherwise concolorous; tips of prolegs dark brown; the 8th abdominal segment, especially on the caudal annulet, giving it a darker, olive colour, the 9th abdominal targite chitinous, shiny, olive colour; caudal setæ prominent, long as the ninth segment; anal prolegs cylindrical, reaching to the tip of the ninth segment, brown at tips; four or five stiff brown setæ above anus; segments of abdomen rather longer caudally."

*Larval Mouth-parts*.—The under side of the larval head is shown in figure 4. I have been unable to homologize the sclerites at the base of the labium and maxillæ; *ca* is evidently the cardo of the maxilla, in two parts; *c* may also be a part of the cardo; *a* and *b* may form one sclerite, though there is a distinct suture between them; *d* forms a band connecting *h* on either side (this same sclerite is found in Coleopterous larvae, and seems to be the ventral sclerite of a head segment); *e* is membranous, and in it lie chitinized sclerites *g* and *f*. From *g* the occiput (?) *i* runs dorsad, the portion *i* of the figure being the break caused by the detachment of *i* from *j* on the slide; *j* is distinct from *h*, and caudally there is a distinct suture

at *x*, separating it from the dorsal portion of the head. The dotted line extending in front of the ocelli is hypothetical, but traces of it can occasionally be distinguished in other larvæ, and the separation of these two ocelli from the others indicates it. The long band with enlarged ends, marked *k*, lies within the head above the maxilla and is strongly chitinized.

I call attention to these different parts for the purpose of pointing out the necessity for the study of the sclerites of the larval head. I have consulted several specialists of Lepidopterous larvæ without securing any information as to the identity of these parts. I have found the same difficulty in Coleopterous larvæ. Certainly these parts possess more or less taxonomic value, and it seems to the writer that we err if we fail to delineate and describe them in the description of larvæ. But as long as we have no terminology, this is difficult and will probably be neglected by most students. Studies are certainly needed along this line.

*Pupa*.—Described from cast skins and one specimen nearly ready to transform.

5.5 x 1.3 mm.; deep orange brown; head, thorax and exposed portions of appendages blackish; spines on abdominal segments tipped with black; seta light; thorax and first abdominal segment without dorsal spines; second abdominal segment with caudal row of spines; third to seventh abdominal segments with spines, as in Fig. 5; eighth to tenth, as in the figure; segments one to six subequal in length; seventh shorter; eighth to tenth, adnate; eighth and ninth together as long as sixth, tapering caudad from fourth segment. In the figure *x* marks a break between *a* and *b* in the cast skin from which drawn. Concerning the identity of sclerites *a* and *b*, I am in doubt.

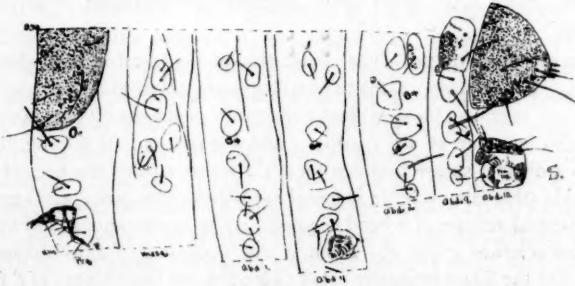


FIG. 2.

## EXPLANATION OF FIGURES.

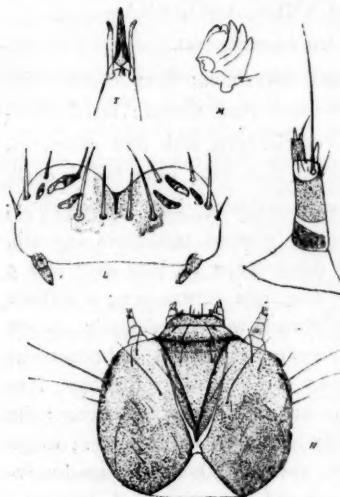


FIG. 3.

Fig. 2.—Tubercles of larva of *Steganoptycha pyricolana* diagrammed; *d. m.*, dorso-meson; *v. m.*, ventro-meson; *pro.* meso, pro and meso-thorax; *abd.* 1-10, abdominal segments, 1 to 10; *sp.*, spiracle.

Fig. 3.—Larval mouth-parts of *Steganoptycha pyricolana*: *l.*, labrum; *m.*, mandible; *a.*, antenna; *h.*, dorsal aspect head; *t.*, tarsus; all enlarged.

Fig. 4.—Ventral aspect of head of larva of *Steganoptycha pyricolana*, enlarged; for discussion of parts, see text.

Fig. 5.—Pupa of *Steganoptycha pyricolana*; *a.*, dorsal aspect 4th abdominal segment; *b.*, dorsal aspect 8-10th abdominal segments.



FIG. 4.

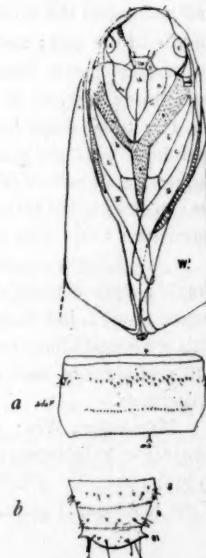


FIG. 5.

## NEW BEES OF THE GENUS ANDRENA.

BY S. GRAENICHER, MILWAUKEE, WIS.

*Andrena thaspiae*, n.sp. ♀.—Length 10-11 mm.; black, clothed with light ochraceous pubescence; head broader than thorax; facial quadrangle broader than long; cheeks broad, shining, with fine punctures, which are very close immediately behind the eyes; front below ocelli distinctly striate; facial foveæ broad, containing light pubescence; antennæ long and slender, black; flagellum brownish testaceous beneath, especially towards the tip; joint 3 of the antennæ as long as 4 and 5 together; clypeus shining, clothed with thin, light pubescence; a distinct impunctate line in the middle, otherwise with moderately coarse punctures; basal process of labrum truncate; mandibles dull testaceous at the tips; mesothorax slightly shining, and covered with short, thin pubescence; on the scutellum the hairs are rather long and dense; the punctures of the mesonotum are shallow and not close together; wings yellowish hyaline, hardly clouded at the apex, with honey-coloured nervures and stigma; second submarginal cell slightly narrowed above, about half as long as the third, receiving the first recurrent nervure beyond the middle of the cell; metathoracic enclosure defined by an impressed line, its surface more finely sculptured than the surrounding area of the metathorax, except at the base, where it is slightly rugose; legs dark brown; tibial scopæ bright fulvous, shining; the basal joints of the middle and hind tarsi are covered with ferruginous pubescence on their inner surface; abdomen shining, with sparse light hairs which are long on the first segment, but otherwise very short, forming thin apical fasciæ on segments 2 to 4; anal fimbria dark fulvous, inclining to ferruginous.

♂.—Length 9 mm., pubescence of head and thorax longer than in female; clypeus more closely punctured throughout; joint 3 of antennæ longer than 5, but distinctly shorter than 4+5; metathoracic enclosure with the longitudinal rugæ extending throughout its whole length; joints 2 to 5 of anterior and middle tarsi, and all the joints of posterior tarsi, ferruginous.

Milwaukee, Wis.; 5 ♂ and 9 ♀ specimens captured on the flowers of *Thaspium trifoliatum aureum*, and *Angelica atropurpurea*, between May 29 and June 23. The females obtain their pollen mostly from the flowers of the first-named plant.

*Andrena Cockerelli*, n. sp. ♀.—Length 10-11 mm.; black, with long, thin, whitish pubescence; a few black hairs on front below ocelli; facial foveæ broad, black, reaching a little below the insertion of the antennæ; antennæ dark, joint 3 longer than 4 and 5 together; clypeus convex, somewhat shining, distinctly roughened and closely punctured; a median narrow and slightly elevated impunctate line; process of labrum triangular, notched at tip; mandibles black, slightly ferruginous near the tips; cheeks broad and evenly rounded, finely roughened, clothed with long, white pubescence; mesonotum dull, tessellate, with sparse, hardly visible, punctures; the disc of the mesonotum is somewhat shining, as also the scutellum; enclosure of metathorax small, bordered by an impressed line and somewhat rugose at base; wings hyaline, nervures and stigma testaceous; the second submarginal cell is about two-thirds as long as the third and receives the first recurrent nervure far beyond the middle of the cell; abdomen shining, minutely granular, without punctures; the thin white pubescence of the abdomen is most conspicuous on the first segment; legs dark brown, with white pubescence; the basal joints of the tarsi are clothed with fuscous hairs on their inner surface; anal fimbria dark purplish brown.

♂.—Length 9 mm.; the pubescence is of a purer white than in the female; in addition to the black hairs below the ocelli, there is a narrow row of black pubescence immediately behind and in front of the eye; there is also a patch of black hairs on the sides of the metathorax; head large, broader than the thorax; antennæ long, slender, joint 3 hardly as long as 4 + 5; the surface of the clypeus is concealed by long and dense pubescence; mandibles long and slender; cheeks broad, produced into a rounded angle, which is situated above the middle of the eye.

Milwaukee, Wis.; numerous ♂ and ♀ specimens from April 6 to 30, on flowers of willows, especially of *Salix discolor*. Kent Co., Mich.; 1 ♂, April 1, 1902 (collected by A. D. Macgillivray, received from Prof. T. D. A. Cockerell). Hartford, Conn.; 1 ♀, April 19, 1896 (collected by S. N. Dunning, No. 1011, received from Prof. T. D. A. Cockerell).

The females are all about the same length. The males vary considerably in size, ranging from 6 to 9 mm. in length. This species resembles *A. macoupinensis*, Rob., but differs from it mainly in the following characters: Facial foveæ distinctly black (pale in *macoupinensis*); legs dark brown (hind tibiæ and tarsi ferruginous in *macoupinensis*);

anal fimbria dark purplish-brown (ochraceous in *macoupinensis*). It is also very close to *A. perarmata*, Ckll., a species with black facial foveæ. In this respect Prof. Cockerell, to whom several of my specimens were submitted, writes as follows: "Your ♀ differs from ♀ *perarmata* by lacking the black hair on metathorax. Also, type *perarmata* has the process of labrum more pointed than in your insect." The ♂ of *Cockerelli* may be readily distinguished from that of *perarmata* by the absence of a tooth at the base of the mandibles.

*Andrena Milwaukeensis*, n. sp. ♀.—Length 11 mm.; black, with bright fulvous, erect, stiff hairs on vertex, thorax above, and first two segments of abdomen above, otherwise the pubescence is black; vertex minutely granular; cheeks rounded, with thin, black pubescence, which does not conceal the sparse shallow punctures; front finely striate; facial foveæ broad, appearing dark chocolate brown when viewed from above; antennæ slender, brownish, dull ferruginous beneath towards the tip; joint 3 of flagellum hardly longer than 4 and 5 together; a patch of light hair about the insertion of the antennæ; clypeus smooth, shining, covered with short, thin, black pubescence; on the sides of the clypeus the punctures are small and crowded, towards the middle they become coarse and rather sparse; a median impunctate and polished area, widening gradually below; process of labrum shining, truncate, emarginate; mandibles black with a ferruginous area near the tips; the mesonotum and scutellum are opaque, granular, not punctured, thickly covered with fulvous pubescence; tegulae testaceous; wings fibro-hyaline, stigma testaceous, nervures dark brown; second submarginal cell somewhat narrowed above; the first recurrent nervure joins the latter near the second transverse cubital nervure; third submarginal cell more than twice as long as second; enclosure of metathorax distinctly outlined by a smooth impressed line, with small rugæ at its base; legs black, with black hairs, becoming dark brown on the front tibiae; abdomen tessellate, without punctures, black, shining, with slight metallic reflections; segments 2 to 4 are depressed about one-third apically; there is a patch of fibrous pubescence on segments 1 and 2, covering segment 1 almost entirely, and becoming narrow towards the apex of segment 2; otherwise the segments are clothed with short, stiff black hairs, not forming apical fasciæ; anal fimbria black.

♂.—Length 9 mm.; differs from the female as follows: Pubescence longer, but thinner, entirely fulvous, without a trace of black hairs; head

extremely broad ; clypeus with small punctures throughout, except a median impunctate and very narrow line ; mandibles very long and slender, strongly curved, with tips entirely ferruginous ; joint 3 of the very long antennae shorter than 4+5 ; cheeks considerably produced, forming a rounded angle above the middle of the eye ; sixth and seventh abdominal segments with thin fulvous pubescence.

Milwaukee, Wis.; 4♂, 13♀ specimens taken between May 4 and June 23, on various flowers. The colour of the pubescence varies from light ochraceous to bright fulvous in the female. One of my male specimens has only 2 submarginal cells on each side. This species resembles *A. Hallii*, Dunning, but the latter is a larger insect, and differs otherwise from *A. Milwaukeeensis*. In some of the females the patch of fulvous pubescence on the abdomen extends even to the tip of the third segment. This patch of light ochraceous or bright fulvous pubescence on the first 2 or 3 abdominal segments separates this species from *A. Hallii*, as also from any of the species of *Andrena* flying in this locality.

*Andrena viburnella*, n. sp. ♀.—Length 11 mm.; body robust, black ; head, thorax and legs with very light ochraceous pubescence ; vertex distinctly roughened, not punctured ; cheeks tessellate, finely and closely punctured ; the thin pubescence is slightly longer on the lower portion of the cheeks than on the face ; front coarsely striate, with a median ridge extending from the ocellus to the base of the antennæ ; the upper one-third of this ridge is low, but the remaining part is very prominent ; facial quadrangle broader than long ; antennæ stout, dark brown, with testaceous tips ; joint 3 about equaling joints 4+5, certainly not longer ; facial foveæ broad, with dark reddish-brown pubescence ; clypeus shining, clothed with short hairs ; the punctures of the clypeus are close and moderately coarse ; a median impunctate stripe is visible ; process of labrum long, truncate ; mandibles black, ferruginous on their apical halves, notched within near the tips ; mesonotum thickly covered with short, stiff hairs, its surface is dull, tessellate, with close, shallow punctures ; scutellum shining, somewhat swollen, with a median impression ; its punctures are closer and more distinct than those of the mesonotum ; tegulae piceous ; wings dusky, nervures and stigma ferruginous ; second submarginal cell not as broad as third, receiving the first recurrent nervure at the middle ; metathorax coarsely roughened, its enclosure defined by a faint impressed line ; the enclosure is somewhat

rugose at base, otherwise finely sculptured; legs dark brown, the small tarsal joints ferruginous; tibial scopa shining, of a lighter colour than the pubescence of the body in general; abdomen shining, bare, without hair-bands; segments 2 to 4 closely and finely punctured, depressed about one-third apically; the depressions are tessellate, and contain only a few scattered punctures; anal fimbria dark fulvous.

Milwaukee, Wis.; 2 ♀ specimens, May 29, 1902, from the flowers of *Viburnum lentago*. In the type specimen the legs are dark brown; in the second specimen the legs are inclined to ferruginous.

*Andrena albofoveata*, n. sp. ♀.—Length 9 mm.; black; pubescence whitish, more or less yellowish on mesonotum; facial quadrangle broader than long; head with short, sparse pubescence; cheeks finely roughened, with very small punctures; front striato-punctate; facial foveæ very broad above, narrowing gradually below and not unusually separated from eye; the pubescence of the foveæ is silvery-white, appressed; antennæ robust, black, somewhat testaceous beneath; joint 5 shorter than 4, both together longer than 3; clypeus nearly bare, shining, with close and coarse punctures, and an elevated impunctate line; process of labrum small, shining, lightly truncate; thorax with short, thin, erect pubescence; mesonotum hardly shining, with fine punctures, which are close on the sides, but sparse on the disc; median and parapsidal grooves present, the latter very distinct; scutellum shining and more coarsely punctured than the mesonotum; tegulæ piceous, a testaceous spot exteriorly; wings yellowish-hyaline with rufo-testaceous nervures and stigma; second submarginal cell about one-third as long as the third, and receiving the first recurrent nervure near the second transverse cubital nervure; enclosure of metathorax with longitudinal rugæ, bordered by a low transverse ridge; legs very dark brown, covered with griseous hairs; on the inner surface of the basal joints of the tarsi the pubescence is yellowish; segments of abdomen depressed about one-third apically, closely and finely punctured throughout; there are thin apical fasciæ of whitish pubescence, which are interrupted in the middle on segments 2 and 3; anal fimbria light fulvous, sparse.

Milwaukee, Wis.; 7 ♀ specimens, June 15 and 16, 1902, on flowers of *Angelica atropurpurea*. This species belongs to the genus *Trachan-drena*, Rob. It is rather variable; in some of the specimens the pubescence is light ochraceous, and the hind tibiæ and tarsi are ferruginous.

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SOME APHIDIDÆ OF THE GENUS NECTAROPHORA FROM  
NEW MEXICO.

BY T. D. A. COCKERELL, EAST LAS VEGAS, N. M.

*Nectarophora rudbeckiae* (Fitch).

*Hab.*—Beulah, N. M., alt. 8,000 ft., very abundant on *Rudbeckia ampla*, A. Nelson. It is preyed upon by *Hippodamia convergens*. This species is easily known by its bright scarlet colour. Monell reports *N. rudbeckiae* from many genera of Compositæ at St. Louis, Mo.; in New Mexico I have found it only on one species of *Rudbeckia*; even the species on *Rudbeckia hirta* is quite different.

*Nectarophora solidaginis* (Fabr.).

*Hab.*—Beulah, N. M., July 26, numerous on *Solidago*. Blackish-red, some almost black; nectaries black; cauda light yellowish; stigma pale greenish (yellowish in *N. rudbeckiae*); femora with basal two-thirds pale yellowish, distal third blackish. The very young may be slightly tuberculate dorsally. Many of the young are bright red. In the winged female the cauda is just half the length of the nectaries; the latter are imbricated.

This species is very near to *N. rudbeckiae*, but evidently distinct. It agrees with Buckton's account of European *N. solidaginis* in all essential particulars; Buckton's description and figure indicate a black cauda, but in his table on p. 102 he says it is yellow. The species is new to America, but is evidently native; a member of the circumpolar fauna.

*Nectarophora corallorhizæ*, sp. n.

*Hab.*—Beulah, N. M., July, 1902 (W. P. Cockerell). Numerous on *Corallorrhiza multiflora*.

*Apterous* ♀.—Green (pale yellow mounted in balsam), without markings; length  $2\frac{1}{2}$  to nearly 3 mm.; eyes scarlet; cauda pallid; nectaries very long, colourless at base, blackish in middle, paler beyond, but blackish again at the extreme tip; antennæ pale, dusky at ends and at the joints; legs pale, apical portion of femora dusky; tarsi black or nearly so. Antennæ over 3 mm.; cauda ensiform, about  $630 \mu$ ; nectaries  $1400 \mu$ ; antennal joints measuring in  $\mu$ ; (1.) prox. 150, (2) 100, (3) 1130, (4) 920, (5) 730, (6a.) 150, (6b.) 1020.

Nectaries slender, often curved outwards towards the end. Sensoria few, on under side of basal half of third joint.

*N. lutea*, Buckton, found on greenhouse orchids, is yellow, with a large dorsal dark brown spot, and has much shorter nectaries. *N.*

*urticæ*, Kalt., seems to resemble our insect as much as anything, but it is not the same.

*Nectarophora agrimonella*, sp. n.

Hab.—Beulah, N. M., July 27, 1902 (*W. P. and T. D. A. Cockerell*). Very abundant on *Agrimonia eupatoria*, Auctt., inhabiting the flower-stalks.

*Winged* ♀ (full of young).—Large, light apple green (orange-ferruginous mounted in balsam), without markings; eyes black; femora with basal two-thirds light green, distal third black, or sometimes less (about 90  $\mu$ ); distal 90  $\mu$  of tibiae, and all of tarsi, black; nectaries suffused with blackish; antennæ dusky, joint 3 black except the basal 30  $\mu$ ; third antennal joint with very numerous (about 32) protuberant sensoria, about equally distributed on the proximal and distal halves; cauda tapering, with a blunt tip, sides with bristles set on little prominences; no capitate hairs anywhere.

Length of body about 3 mm., wings about 3½ mm.; other measurements in  $\mu$ :—Antennal joints: (1.) 120, (2.) 110, (3.) 1100, (4.) 900, (5.) 730, (6a.) 160, (6b.) 1230. Cauda about 450; nectaries 1000, with imbricated surface; beak 700 to 750; anterior femur 1000; marginal cell with substigmatal portion 380, and poststigmatal portion 660.

Allied to *N. erigeronensis* (Thos.), which it resembles in the numerous sensoria on joint 3.

*Nectarophora rudbeckiarum*, sp. n.

Hab.—Beulah, N. M., July 26, 1902, on *Rudbeckia ampla*, with *N. rudbeckiae*, but not nearly so numerous.

*Winged* ♀.—Light green; eyes, ends of tibiae, and tarsi, black. Length of body about 2¼ mm., of wings about 4½ mm. Measurements in  $\mu$ : Nectaries 1200; cauda about 600, breadth at base 120, in middle 170; beak about 750; anterior femur 1500; antennal joints, (3.) 1200, (4.) 1250, (5.) 1070; marginal cell with substigmatal portion 420, poststigmatal 500. *Apterous* ♀ about 4 mm. long, including cauda. This cannot be a green variety of *N. rudbeckiae*, for the following reasons:

(1.) *N. rudbeckiae* has much shorter nectaries, not over 850  $\mu$ .

(2.) *N. rudbeckiae* has a longer marginal cell, with substigmatal portion 550, poststigmatal 700  $\mu$ .

*N. rudbeckiarum* differs as follows from *N. agrimonella*:

(1.) The third antennal joint is not nearly so dark, and has only about ten hardly protuberant sensoria, which are practically confined to the basal half of the joint.

(2.) The cauda, which in *agrimoniella* tapers from the base to the apex, in *rudbeckiarum* is spear-head shaped, with the base narrower than the middle. These descriptions represent the cauda as seen from above.

(3.) The apical portion of the stigma is narrower and more produced than in *agrimoniella*.

(4.) The femora are not at all black at distal end.

(5.) The nectaries are green. This character distinguishes the species from *N. erigeronensis*.

*N. rudbeckiarum* turns orange-ferruginous mounted in balsam; darker than *N. agrimoniella*.

*Nectarophora heleniella*, sp. n.

*Hab.*—Beulah, N. M., July 26, on flower-heads of *Helenium hoopesii*, Gray. Not numerous.

*Winged ♀*.—Apple green, smaller and deeper coloured than *N. rudbeckiarum*; length of body about 2 mm., wings about  $3\frac{1}{3}$ . Eyes black; nectaries only slightly dusky; femora greenish, only moderately suffused with blackish apically; antennae black, except short basal joints and extreme base of third joint; third joint with nine large and four small sensoria, the last one  $45 \mu$  from base of joint. Measurements in  $\mu$ : Nectaries 710; cauda about 300, tapering from base to apex, in the manner of *N. agrimoniella*; beak about 600; anterior femur 920; antennal joints, (3.) 770, (4.) 660; (5.) 530, (6a.) 140, (6b.) 1140. Marginal cell with substigmatal portion 320, poststigmatal 500.

The apterous form (immature) has the cauda short and broad, broad-pyramidal in outline seen from above. The immature form is slightly pruinose, and has a darker green dorsal band.

Allied to *N. gerani*, but distinct.

*Nectarophora Martini*, sp. n.

*Hab.*—Beulah, N. M., 1902, on many plants. Named after my son Martin, who used to help me collect insects at Beulah. The form on *Helenium* may be taken as the type. Similar to *N. sonchi* (L.), of which *N. ambrosiae* (Thos.) is the American representative, if not a synonym, but differs especially in the young, which are pruinose and do not share the piliferous tubercles. It is also allied to *N. sonchella*, Monell, but the fourth antennal joint is not tubercular, and to *N. calendulae*, Monell, but that has the third joint very slightly tubercular. The two last-mentioned are also not pruinose when young, so far as I can learn; herein they will agree with *N. solidaginis*, which is easily known from *N. Martini* by the much redder, non-pruinose, young, as well as the shorter nectaries of the winged female.

I assume that the insects collected on different plants are the same species, because I am unable to find any tangible characters to separate them; but I give my notes on each lot separately:

(1.) On *Rudbeckia hirta*, Aug. 4. Winged form dark reddish to practically black; nectaries black, cauda pale yellowish; femora with apical half black, basal half pale; stigma pale greenish. Apterous form shiny, 3 mm. long, not counting cauda.

Winged ♀.—Cauda ensiform, with large lateral bristles; length about 500  $\mu$ . Nectaries about 1000  $\mu$  long, black. Eyes black. Antennal joints in  $\mu$ , (3.) 1070, (4.) 980, (5.) 850, (6a.) 200, (6b.) 1300. Stigma tapering, marginal cell with poststigmatal part considerably longer than substigmatal. Antennæ black, joint 3 with prominent sensoria (at least 40) along its whole length except extreme ends. Joint 4 without sensoria. The other lots enumerated below showed the same microscopic characters except some little difference in size, and a smaller number of sensoria on joint 3 in the material from *Potentilla* and *Fraseria*.

(2.) On heads of *Helenium hoopesii*, July 26. Young and apterous adults. The young are reddish, with greenish legs, and have a decided bluish pruinose bloom. They are not tuberculate. The apterous adults are shiny dark wine-red, with the legs as in *N. rudbeckiae*; i.e., basal two-thirds of femora pale ochreous, apical third, and tibæ and tarsi, black or blackish. Nectaries long, black, obviously longer than in *rudbeckiae*. The bluish bloom is conspicuous even in subadults. On Aug. 3 the species was found in great abundance, winged specimens being present. The green species (*N. heleniella*) was present in smaller numbers; it cannot be a colour-variety of *N. Martini*, owing to the great difference in the sensoria on the third antennal joint. Measurements in  $\mu$ :—Apterous ♀: nectaries 1330; antennal joints, (2.) 120, (3.) 1100, (4.) 900, (5.) 735, (6a.) 150, (6b.) 1030. Winged ♀: nectaries 820; antennal joints, (3.) 930, (4.) 790, (5.) 710, (6a.) 180, (6b.) 1090.

(3.) On *Fraseria speciosa*, Auctt., abundant. Winged ♀: dark wine-red; stigma yellowish; legs black, basal  $\frac{2}{3}$  of femora and coxae, pale greenish; nectaries black, yellow at extreme base; cauda reddish. Immature forms pruinose. Measurements in  $\mu$ —Winged ♀: nectaries 1000; antennal joints, (1.) 160, (2.) 100, (3.) 960, (4.) 810, (5.) 720, (6a.) 170, (6b.) 1000.

(4.) On flower-heads of *Zygadenus Nuttallii*, Coulter. Flora, abundant July 31. Winged ♀: Head and thorax reddish-brown, abdomen darker; nectaries black, pale at extreme base; femora very pale greenish, black at apex; young pruinose.

(5.) On *Eriogonum* (a tall species with greenish-yellow flowers), July 29, a few only. Winged ♀: Shining very dark plum colour; abdomen same colour as head and thorax; legs black, basal half or less of femora, and coxae, pale ochreous; nectaries black; cauda and stigma ochreous yellow; antennae black; wings strongly iridescent. Young pruinose, with olive-slate legs, antennae and nectaries. The nectaries are obviously shorter than in the *Potentilla* form, and are held erect. Apterous ♀: 2½ mm. long. Measurements in  $\mu$ : nectaries 810; antennal joints, (1.) 150, (2.) 100, (3.) 920, (4.) 770, (5.) 650, (6a.) 185, (6b.) 680.

(6.) On *Ligusticum* (species with yellow flowers), July 29; not many. Winged ♀: Dark brown; nectaries black; legs black, basal half of femora, coxae and basal half of tibiae more or less, yellowish. Measurements in  $\mu$ : nectaries 840; antennal joints, (1.) prox. 150, (2.) 100, (3.) 880, (4.) 730, (5.) 710, (6a.) 200, (6b.) 1220. The *Ligusticum* grew mixed with the *Potentilla* next mentioned.

(7.) On *Potentilla* (apparently *P. pulcherrima*), July 29, first found by my wife; very abundant. Dark reddish-gray, winged form with the head and thorax more decidedly red, contrasting with the darker abdomen. Half-grown more or less pruinose, with legs, antennae and nectaries dark olive. In the winged form these parts are black or blackish, with the basal two-thirds of femora light yellowish. Stigma light yellowish. Nectaries over twice length of cauda, which is pink. Measurements of winged ♀ in  $\mu$ : nectaries 990; antennal joints, (1.) prox. 150, (2.) 100, (3.) 980, (4.) 950.

The specimens on the *Potentilla* have the nectaries a trifle shorter than those on *Frasera* and *Zygadenus*, but otherwise appear just the same. Curiously, however, the *Potentilla* form when disturbed jerks to and fro, but will not drop to the ground; while those on *Frasera* and *Zygadenus* do not jerk nearly so readily, neither do they fall. This difference in the reaction of the creature to irritation was repeatedly observed, and suggested that the species were different, but I am quite unable to find satisfactory morphological characters to separate them. Monell has remarked that *N. sonchella* always drops to the ground when disturbed.

#### *Nectarophora*, spp.

Other species of *Nectarophora* were taken at Beulah on *Sophia incisa*, *Geum*, *Gnaphalium decurrens*, *Phacelia circinata*, *Erigeron* and *Populus angustifolia*, but I did not secure the winged females and so have deferred their description.

## SYNOPSIS OF NOMADINÆ.

BY CHARLES ROBERTSON, CARLINVILLE, ILLINOIS.

This paper is intended to give the results of the study of the local species.

Unless otherwise indicated, vein  $a$  = basal nervure; vein  $V_2$  = transverse medial nervure; vein  $rm$  = first cubital nervure; cell  $III_{1+2}$  = marginal cell; cell  $III_3$  = second cubital cell; "joint" refers to antennæ; "segment" refers to abdomen.

There has been enough confusion in this group to suit the most stupid of lumpers. It takes a mystagogue to identify a species from a description of its ornaments. Such descriptions are regular pitfalls—regular synonym-traps. The description of *N. bisignata*, Say, can be duplicated from five different local species. Mrs. Annie Trumbull Slosson sent me specimens of the immaculate form of *Gnathias ovatus*, which had been identified for her as *N. incerta*. The former has bidentate mandibles and simple coxae, while the latter has simple mandibles and spined coxae, and is the female of *Centrius americanus*. The synonymy is given in *Tr. Am. Ent. Soc.*, 22: 125. Here the question arises as to whether the *N. americana*, Kirby, is the same as *N. incerta* or the same as this immaculate form of *G. ovatus*. The latter is rare, and has the abdomen much paler than indicated in Kirby's description of the former. Then, which one of these is the immaculate variety of Say's *N. bisignata*? Here, also, *N. incerta* is by far the more probable determination. *N. simplex*, with simple mandibles, was identified as *N. bella*. On comparing the type, I found that *N. bella* had bidentate mandibles.

*N. affabilis*, Cr., is composite. The N. Y. specimen, on which the description was evidently based, is regarded as the type. The Ill. specimen is the male of *N. vincta*. The ornaments of the two species are almost identical.

*N. rubicunda*, Oliv., (= *N. torrida*, Sm.) belongs to *Centrius*.

*N. bella* and *maculata* belong to *Gnathias*. I have examined the types of the former twice, and of the latter once. They resemble *G. cuneatus*, but are quite different from the local specimens. *N. maculata* is much larger and more red. At present I would not unite them. The two local species are very common and very variable. In the table I have indicated the colour forms at some length. They seem to show a strong tendency to divide into several species, and there may be differences in the hosts which they infest. I cannot separate the males in the same way.

In this paper *Gnathias cuneatus* and *ovatus* and *Xanthidium dentariae* are described as new, and the male of *Centrias erigeronis* is described for the first time.

After *Cephen* was characterized as given in the table, I suspected that it might be the same as *Micronomada*, Ckll., but I could not identify that genus without getting specimens of the type, *N. modesta*, for examination. *N. modesta* has the cell  $III_5$  strongly narrowed above, cell  $III_{1+2}$  less obtuse, and the vein  $\alpha$  ends a little before or is interstitial with  $V_2$ . The front coxae have a tubercle above the spine. The other structural characters are quite similar, and show that the two genera are closely related, but the venation is so different that I have decided to let *Cephen* stand. *N. fervida*, Sm., also belongs to *Cephen*.

*Heminomada*, Ckll., like *Micronomada*, Ann. Mag., N. H., VII., 10 : 42-4, 1902, I would raise to generic rank. Of 37 specimens in my collection, 9 have three submarginal cells in one or both wings.

Vein  $rm$ , usually wanting in *Heminomada*, I have also found wanting in *N. Cressonii* (1) and *Sayi* (1). Vein  $III_5$  I have found wanting in *Gnathias cuneatus* (1), *Centrias Americanus* (1), *rubicundus* (1), *Nomada parva* (1).

I have to thank the authorities of the American Entomological Society for the privilege of examining co-types of *N. affabilis* and *bella* and specimens of *N. modesta*. Mr. Viereck noted several points in which the N. Y. specimen of *N. affabilis* differed from the co-type sent me for examination.

In his early descriptions Mr. Cresson mentions the structure of segment 7 of the males, and in his later ones notes the form of the joints of antennæ.

#### Females.

Mandibles bidentate; joint 3 shorter than 4; vein $\alpha$ before $V_2$ ; head and thorax red; sutures, depressed and concealed portions black.....	<i>Gnathias.</i>
Mandibles simple.....	1.
1. Front coxae simple; rarely ( <i>N. denticulata</i> ) with short, indistinct spines.....	3.
Front coxae with long pubescent spines; abdomen distinctly punctured.....	2.
2. Joint 3 longer than 4; vein $\alpha$ beyond, or interstitial with, $V_2$ ; cell $III_5$ subquadrate, $III_{1+2}$ obtuse; joint 1 of labial palpi twice as long	

as 2-4, 2 flat, as long as 3+4, which are simple and directed obliquely outward ..... *Cephen*.  
 Joint 3 shorter than 4; vein *a* a little before  $V_{\frac{1}{2}}$ ; cell  $III_5$  more narrowed above;  $III_{1+2}$  acute; labial palpi ordinary; abdominal fasciae, when present, continuous on segments 4-5, interrupted, reduced or wanting on 1-3 ..... *Centrias*.  
 3. Joint 3 distinctly shorter than 4 ..... 5.  
 Joint 3 longer than 4, rarely a little shorter ..... 4.  
 4. Head and thorax without yellow ornaments, red; sutures, depressed and concealed portions black; vein *a* interstitial with  $V_{\frac{1}{2}}$ ; apex of hind tibiae with black curved bristles; joints 3-4 subequal; abdomen red, a whitish spot on each side of segments 2-3, two subdiscal, usually cuneate, spots on 4, and a transverse spot on 5; these marks sometimes wanting on 4, rarely on 2 and 5 ..... *Phor*.  
 Head and thorax with yellow ornaments, usually black ..... *Holonomada*.  
 5. Head and thorax without yellow ornaments; vein *a* before  $V_{\frac{1}{2}}$  ..... *Nomada*.  
 Head and thorax with yellow ornaments ..... 6.  
 6. Vein *rm* usually (75%) wanting in one or both wings; largely red; segments 2-5 with yellow fasciae, sometimes interrupted on 2 ..... *Heminomada*.  
 Vein *rm* present; mesonotum with four yellow lines; segments 1-6 with yellow bands ..... *Xanthidium*.

## Males.

Mandibles bidentate ..... *Gnathias*.  
 Mandibles simple ..... 1.  
 1. Front coxae simple, rarely (*N. denticulata*) with short, indistinct spines ..... 3.  
 Front coxae with pubescent spines; abdomen distinctly punctured ..... 2.  
 2. Scape ordinary; joint 3 longer than 4; vein *a* beyond, or interstitial with,  $V_{\frac{1}{2}}$ ; cell  $III_5$  subquadrate,  $III_{1+2}$  obtuse; segment 7 bifid ..... *Cephen*.  
 Scape robust; joint 4 = 5 + 6, 5 with a spine beneath; flagellum usually yellow beneath, middle joints short, submoniliform, the last produced to a point ..... *Centrias*.  
 3. Segment 7 notched; joint 3 shorter than 4 ..... 5.  
 Segment 7 entire ..... 4.

4. Joint 3 shorter than 4 ; vein  $\alpha$  interstitial with  $V_2$  ; abdomen red, with whitish ornaments..... *Phor.*  
 Joint 3 longer than 4 ; abdomen black, with yellow ornaments..... *Holonomada.*

5. Vein  $rm$  usually wanting ; segments 1-6 with yellow bands, that on 1 usually red..... *Heminomada.*  
 Vein  $rm$  rarely wanting..... 6.

6. Segments 1-6 with entire and continuous bands, sometimes narrowly interrupted on 1 ; vein  $\alpha$  before  $V_2$ ..... *Xanthidium.*  
 Segments 1-6 without entire and continuous bands, usually with some lateral spots ; when continuous, the bands have separated spots on extreme sides of 5..... *Nomada.*

Gnathias, gn. nov. (Type *Nomada bella*, Cresson).  
 Females.

Pygidium ovate, rather closely punctured and pubescent ; lower anterior orbits yellowish ; mesonotum commonly trilineate ; rather yellowish red, the spots small and hardly contrasting with the ground colour..... *ovatus*, sp. nov.  
 70 specimens fall into the following forms, according to their colour patterns. The ornament on the side of segment 4 is counted as one spot. It consists of an elongated spot, or its representatives : (1) when the spot is broken in two, or (2) when the lateral portion disappears, leaving a subdiscal, more or less cuneate spot.

A spot on each side of segments 2-4 and a bar on 5 (10)..... *plenus*.  
 A spot on each side of segments 2-5 (15)..... *octomaculatus*.  
 A spot on each side of segments 2-4 (1), or of 2, 3 and 5 (2)..... *sexmaculatus*.  
 A spot on each side of segments 2-3 (15), or of 2 and 5 (3)..... *quadrimeaculatus*.  
 A spot on each side of segment 2 (22)..... *binotatus*.  
 Abdomen without spots (2)..... *unicolor*.

Pygidium triangular, sparsely punctured and pubescent ; lower anterior orbits not yellowish ; mesonotum one-lined ; rather dark red ; spots distinct, large on segment 2 ..... *cuneatus*, sp. nov.  
 28 specimens show the following forms, the ornaments of segment 2 as in the preceding :

A spot on each side of segments 1-5 (1)..... *decemnotatus*.  
 A spot on each side of segments 2-5 (15)..... *octonotatus*.

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A spot on each side of segments 2, 3 and 5 (1).....*sexnotatus*.  
 A spot on each side of segments 2-3 (11).....*quadrifasciatus*.

Males.

Intermediate joints of antennæ not longer than wide; tegulæ, knees and apex of tibiæ usually yellow; scutel black or marked with yellow, sometimes red; abdomen varying from 6-banded to 4-spotted. *ovatus*.

Intermediate joints longer than wide; tegulæ and legs red; scutel usually red; abdomen varying from 6-banded to 8-spotted. *cuneatus*.

*Cephen*, gn. nov. (Type *Nomada Texana*, Cresson).

Female.

Black; labrum, joints 1-3 and legs red; lemon-yellow ornaments as follows: Base of mandibles, sides of face, line behind summit of eye, collar, tubercles, subarcuate mark on pleura, two spots on scutel, postscutel, spots on middle and hind coxæ and on apex of hind tibiæ, narrow fasciæ on segments 1-5 above and arcuate marks on sides of 3-4 beneath.....*Texanus*.

Male.

Like the female; face, clypeus, spot above, and labrum lemon-yellow.....*Texanus*.

*Centrias*, gn. nov. (Type *Nomada erigeronis*, Rob.).

Females.

Insect red; sutures, depressed and concealed portions more or less black.....*Americanus*.

Insect black; mandibles, face, joints 1-3, tubercles, tegulæ, line above, patches on pleura, scutel, legs, and sometimes venter, red; malar space, collar, axillæ, postscutel and abdominal fasciæ, yellow; the latter interrupted on 1-3, continuous and paler on 4-5; abdomen coarsely punctured, margins of segments reflexed, beneath the punctures are coarse, strong and dense.....*erigeronis*.

Males.

Hind femur arcuate; antenna with a pale annulus; abdomen red at base, black beyond, yellow fasciæ interrupted on segments 1-2, continuous on 3-6; 7 strongly notched.....*Americanus*.

Hind femur simple; antenna without a pale annulus; abdomen black, yellow fasciæ interrupted on segment 1, continuous on 2-6, 7 slightly notched; other ornaments like the female, but the mandibles, face, scape in front, flagellum at base beneath, tubercles, tegulæ, spot on

pleura, coxae and trochanters, more or less, and apices of femora and tibiae, yellow..... *erigeronis*.

Holonomada, gn. nov (Type *Nomada superba*, Cresson).

Females.

Metathorax entirely black..... 2.

Metathorax with two yellow patches; abdomen with five yellow fasciae..... 1.

1. Mesonotum coarsely punctured, pubescent; vein  $\alpha$  before  $V_2$ ; flagellum dark above..... *affabilis*.
- Mesonotum finely punctured, nearly bare; vein  $\alpha$  about interstitial with  $V_2$ ; flagellum with a dark annulus..... *vincta*.
2. Segments 1-5 with continuous yellow fasciae; vein  $\alpha$  usually before  $V_2$ ; metathorax with dentiform lateral angles; scutel acutely bilobed..... *superba*.
- Segment 1 black, or with ferruginous stain, 2-3 with interrupted, 4-5 with continuous bands; vein  $\alpha$  not before  $V_2$ ; scutel hardly bilobed; joint 3 sometimes a little shorter than 4; small..... *placida*.

Males.

Metathorax and posterior orbits black, or nearly so..... 2.

Metathorax with two yellow spots; posterior orbits largely yellow. 1.

1. Scape obovate; vein  $\alpha$  usually interstitial with  $V_2$ ; flagellum darker in the middle; scutel subbilobed..... *vincta*.
- Scape ordinary; vein  $\alpha$  usually before  $V_2$ ; flagellum darker above; scutel bilobed..... *affabilis*.
2. Segments 1-6 with continuous yellow bands; vein  $\alpha$  usually before  $V_2$ ; large species..... *superba*.
- Segments 5-6 with continuous, 2-4 with interrupted, yellow bands, 1 entirely black; vein  $\alpha$  usually interstitial with  $V_2$ ; small species..... *placida*.
- Phor., gn. nov. (Type *Nomada integra*, Rob.)..... *integer*.
- Heminomada, Ckll. (Type *Nomada obliteratea*, Cresson). *obliteratea*.

Xanthidium, gn. nov. (Type *Nomada luteola*, Oliv.).

Females.

Metathorax with subquadrate marks encroaching upon enclosure..... *luteolum*.

Metathorax with subtriangular marks not encroaching upon enclosure..... *luteoloides*.

## Males.

Flagellum denticulate beneath; orbits yellow, except at summit behind ..... *tuteoloides*.  
 Flagellum ordinary; orbits yellow below ..... 1.  
 1. Band on segment 1 interrupted; flagellum submoniliform, fulvous beneath ..... *dentarie*, sp. nov.  
 Band on segment 1 continuous; flagellum unusually dark, piceous beneath, the joints unusually cylindrical ..... *luteolum*.

## Nomada Scop.

## Females.

Head and thorax black, with ferruginous ornaments; abdomen black, with yellow ornaments; interrupted line on segment 1, lateral marks on 2-3, continuous fasciae on 4-5 ..... *vicina*.  
 Head and thorax red, sutures, depressed and concealed portions black ..... 1.  
 1. Scutel quite low, convex, hardly bilobed; joint 4 shorter than 12; black colour of head and thorax rather preponderating over the red; a yellow spot on each side of segments 2-3, two spots on each side of 4, a band or two spots on 5 ..... *simplex*.  
 Scutel crested, bilobed ..... 2.  
 2. Joint 4 shorter than 12 ..... 5.  
 Joint 4 as long as 12 ..... 3.  
 3. Front coxae with short spines; pygidium subacute; yellow fascia on segment 5 opaque, finely rugose, rather sparsely, feebly punctured; scutel strongly crested ..... *denticulata*.  
 Front coxe without spines; pygidium broadly subtruncate ..... 4.  
 4. A spot on each side of segments 2-3, two subdiscal cuneate spots on 4; band on 5 shining, coarsely punctured; larger ..... *Cressonii*.  
 A spot on each side of segments 2-3; smaller ..... *Sayi*.  
 5. A spot on each side of segments 2-3, and usually a band or two spots on 5; pygidium broadly rounded, closely pubescent ..... *Illinoiensis*.  
 A spot on each side of segments 2-5; the smallest species ..... *parva*.

## Males.

Abdomen mainly reddish; vein  $\alpha$  before V<sub>2</sub> ..... 3  
 Abdomen mainly black ..... 1.  
 1. Segments 2-3 with a spot on each side, 1 usually with an interrupted band, 4 with a band or two spots on each side, 5 with a discal band

and a spot on each side, 6 like 5, or the lateral spots wanting, 7 with apex slightly notched..... *vicina*.

Segments 1-6 with bands continuous, or nearly so, usually a separated spot on each side of 5..... 2.

2. Joints 7-10 wider than long; segment 7 strongly notched; pleura, scutel and legs marked with yellow; vein *a* beyond  $V_2$ ..... *salicis*.

Joints 7-10 longer than wide; segment 7 slightly notched; pleura and scutel black; legs less yellow; vein *a* before  $V_2$ ..... *simplex*.

3. Flagellum distinctly denticulate beneath; front coxae with short spines; a spot on each side of segment 2, sometimes one on 1, usually continuous bands on 3-6..... *denticulata*.

Flagellum and front coxae ordinary..... 4.

4. Joint 4 shorter than 13..... 6.

Joint 4 as long as 13..... 5.

5. Thorax largely red; larger..... *Cressonii*.

Thorax almost entirely black; smaller..... *Sayi*.

6. Apical half of abdomen reddish; middle joints of flagellum longer than wide..... *Illinoiensis*.

Apical half of abdomen blackish; middle joints of flagellum hardly longer than wide..... *parva*.

THE NORTH AMERICAN SPECIES OF *PEDILOPHORUS*.

BY H. F. WICKHAM, IOWA CITY, IOWA.

The Byrrhidæ of this continent have received a comparatively small share of attention at the hands of systematists for many years, so that it is not at all surprising to find novelties among recently-collected material. Two new forms of the genus *Pediophorus* have recently been detected among the accumulations in my cabinet, both of them from the west; no doubt still others remain to reward explorers of the mountain ranges and of the northern districts. The European fauna contains ten species, while but four were previously known from North America. For the sake of better understanding of the new forms, I have constructed the following table, by means of which our native species may be identified:

A. Elytral punctuation disposed in broad vittæ, alternating with nearly smooth stripes. .34 inch..... *Lecontei*, n. sp.

AA. Elytral punctuation not disposed in vittæ.

b. Tarsi simple. A green-bronzed species, clothed with coarse whitish hairs. .17 inch..... *aeneolus*, Lec.

- bb. Tarsi with third joint lobed beneath.
- c. Bright green or bronzed species, pubescence fine, recumbent, without intermixed bristles.
  - d. Acuminate behind, the elytra narrowing from in front of the middle.
    - .16 inch.....*acuminatus*, Mann.
  - dd. Form oblong, elytra parallel, or nearly so, to a point about one-third from tip.
    - .18 inch.....*oblongus*, Lec.
- cc. Blackish species, metallic tinge lacking or inconspicuous.
  - e. Pubescence extremely fine, whitish and ochreous, intermixed with conspicuous black bristle-like hairs. .17 inch.....*subcanus*, Lec.
  - ee. Pubescence whitish or yellowish, not intermixed with bristle-like hairs. .16 inch.*hesperus*, n. sp.

In a cabinet arrangement it might be better to place *oblongus* between *acuminatus* and *aeneolus*, and to make *subcanus* follow *hesperus* rather than precede it. This is the sequence I have adopted in the notes below.

*P. Lecontei*, n. sp.—Oblong-ovate, very convex, bronzed, shining, with extremely fine, sparse, recumbent pubescence. Head with fine, well-separated punctures, front convex. Antennæ gradually clavate, passing the base of the thorax, blackish, the intermediate portion reddish; first joint large, second subglobose, third nearly twice as long as the second, but much more slender, fourth to tenth becoming broader, but subequal in length, eleventh oval, pointed. Thorax broadest at base, strongly narrowed anteriorly, sides scarcely arcuate, a rather deep submarginal lateral impression, which curves inward at the hind angles; posterior angles large, acute, but with somewhat irregular outline, basal marginal line distinct, fine, a small fovea in front of the scutellum; disk finely, regularly punctured, the punctures separated by a space about equal to their own diameters. Elytra continuing the outline of the thorax, becoming slightly broader to a point about one-third from apex, thence rapidly narrowing, tips separately rounded; an oblique impression near the apex, which renders the declivity more gibbous; surface deeply, regularly and rather closely punctured in longitudinal bands, which leave the sutural region and four vittæ on each elytron nearly smooth. Beneath rather coarsely and deeply-punctured abdominal segments becoming gradually smoother in sequence. Legs closely punctured, all the femora

grooved; tibiae finely spinulose externally; the anterior pair somewhat enlarged towards apex, the middle and hind ones of approximately uniform width in distal two-thirds. Third tarsal joint with a long lobe. Length, 8.5 mm.

This species is much larger than any of the other described North American forms, and looks very much like an *Amphicyrta*. The peculiar punctuation of the elytra gives a vittate effect, recalling *Cytillus*, but there is no alternation of elevation. Only the front tibiae are distinctly grooved for the reception of the tarsi. The antennal club is so gradually formed that it is difficult to say where it begins; the third and fourth joints are of nearly the same width, while in the fifth the enlargement has become apparent.

Cœur d'Alene, Idaho, two specimens, taken by myself in June, under logs. A third specimen from Vernon, B. C., collected by Mr. Venables and communicated by Dr. Fletcher, is slightly smaller, more brilliant, and a trifle more coarsely punctured, the marginal line of the prothorax is less marked, and the head has a frontal transverse row of three foveæ, of which the middle one is larger and deeper. These foveæ are non-essential, however, since one of my specimens has the median one distinct, the other showing also traces of the lateral foveæ.

*P. aeneolus*, Leconte, New Species of North American Coleoptera, Sm. Misc. Coll., No. 167, 1866, p. 74. Originally described from a specimen in the Ulke Collection, captured in Nebraska. I have a number of examples of a *Pedilophorus* from Kalispell, Montana, which may belong here, though I am not quite satisfied with the determination. Mr. Fall expresses himself as being in doubt as to their exact status, and neither he nor myself have seen the type, which is now presumably in the Carnegie Museum at Pittsburg.

*P. oblongus*, Leconte, Report upon Insects collected on the Survey, Pacific R.R. Expl. and Surv., 47th and 49th parallels, p. 39 of separate. *P. acuminatus*†, Leconte, Proc. Acad. Nat. Sci., Phil., Vol. VII., p. 115. Oregon, Leconte. I have specimens from Seattle, Washington, collected by S. Bethel.

*P. acuminatus*, Mannerheim (*Morychus acuminatus*), Bull. Soc. Imp. Nat., Moscow, 1852, p. 341. The type specimens were collected under stones, among moss, at Sitka, Alaska, by Frankenhaeuser and Pipingskoeld. Dr. Fletcher records it as being taken at Massett, Queen Charlotte Islands, under moss during the winter, by Rev. J. H. Keen. I took a single

individual at Hunter's Bay, Alaska, from a cut place on the trunk of a conifer. Two specimens in my cabinet, collected by Rev. Geo. W. Taylor, at Nanaimo, Vancouver Island, are a little more deeply punctured.

*P. hesperus*, n. sp.—Oblong, blackish, feebly shining, a faint æneous tinge, pubescence pale, recumbent, moderately coarse. Head deeply and densely, rather coarsely, punctured, front with a distinct median fovea, around which the punctures are less crowded. Antennæ gradually clavate, about reaching the base of the thorax, piceous-red, club blackish; first joint large and heavy, second subglobose, not quite as thick as the first, third more slender than the second but nearly as long, fourth and fifth subequal, a trifle shorter than the third, sixth broader, seventh to tenth wide, subequal in length, eleventh nearly twice as long as the tenth, oval, pointed. Thorax distinctly, finely and rather closely punctured, narrowed anteriorly, the sides not arcuate but slightly sinuate, lateral margin sharp, front and hind angles acute. Scutellum covered with pale yellowish pubescence. Elytra continuing the outline of the thorax, finely, distinctly and fairly closely punctured and indistinctly sulcate, sides subparallel, tips conjointly rounded. Beneath rufo-piceous, thickly clothed with pale pubescence, which almost conceals the sculpture, especially on the abdomen. Legs piceous, femora paler, all grooved for the reception of the tibiae. Tibiae spinulose externally, front and middle pairs with exterior margin arcuate, hind pair simply broader towards tip. Third tarsal joint lobed beneath. Length, 4 mm.

Leadville, Colorado, July, taken by myself under stones on a hillside. The front tibiae alone are grooved for the reception of the tarsi. The antennæ are much stouter in comparison than those of *P. Lecontei*. In general appearance this insect approaches *P. subcanus*, but is at once distinguished by the lack of bristly hairs among the pubescence. From *acuminatus* it may readily be separated by colour and outline; *oblongus* differs in the bright green colour, strongly shining surface and lack of elytral sulcations, while *æneolus* should at once be separable by the simple tarsi.

*P. subcanus*, Leconte, Coleoptera of Michigan, Proc. Am. Phil. Soc., XVII., 1878, p. 609. Described from Escanaba, Lake Superior. I have it from Bayfield, Wisconsin, on the southern shore of the same lake, and from Leadville, Colorado.

